Research Article

Prevalence of dental caries in fluorinated school children in Dharmapuri district aged 12–18 years

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ABSTRACT

Introduction: Dental fluorosis develops due to excess fluoride intake >1 ppm. Fluoride is used to prevent dental caries as fluoride combines with calcium to form calcium fluorapatite crystals which resist acid dissolvent. However, dental caries is found among the patients who are having dental fluorosis. The present research aims to study the prevalence of dental caries among individuals who are having dental fluorosis. **Materials and Methods:** A total of 140 school children who are exposed to fluoride drinking water in endemic areas of Dharmapuri district, Tamil Nadu, India. All children were examined for dental caries using Dean's fluorosis index and decayed, missing, and filled teeth index. **Results:** The study establishes that in Group 1 among 17 children with questionable dental fluorosis 9 (52.9%) have dental caries. In Group II among 22 children with very mild dental fluorosis 10 (45.4%) have dental caries. In Group III among 27 children with mild dental fluorosis 17 (62.9%) have dental caries. In Group IV among 38 children with moderate dental fluorosis 29 (76.3%) have dental caries. In Group V among 36 children with severe dental fluorosis 30 (83.3%) have dental caries. **Conclusion:** The research concludes that dental caries is present in fluorosis teeth may be due to hypocalcification of fluorosis tooth due to the incorporation of calcium.

KEY WORDS: Calciumfluorapitite crystals, Dean's fluorosis index, Decayed, missing, and filled teeth, Dental caries, Dental fluorosis, Hypocalcification

INTRODUCTION

Environmental pollution of toxic substances causes human health hazards in the society. One of such toxic substance is fluoride. If an individual consumes >1 ppm of fluoride through water, food, air, etc., they will get toxic manifestation in the body and the condition is called fluorosis. If fluorosis occurs in teeth, it is called dental fluorosis.[1] The evidence that excess fluoride intake causes dental fluorosis is well documented. The excessive fluoride intake must occur during the period of tooth formation since the fluoride appears to affect the activity of ameloblasts. The affected ameloblasts produce a defective matrix, on to which during calcification calcium, phosphate and fluoride are deposited as calcium fluorapatite crystals.

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Dental caries is a progressive, irreversible decay of hard calcified structures of the tooth exposed to the action of saliva. The basic mechanism of dental caries provided by Miller, where acidogenic microorganisms of saliva act on accumulated carbohydrate food, it produces acid which dissolves the inorganic substances. Thus, inorganic and organic portion is destroyed in the tooth and caries develop.[2]

In dentistry, we use fluoride which is thought to prevent caries by the formation of calcium fluorapatite crystals. Tooth containing calcium fluorapatite crystals is resistant to acid dissolution and thus caries can be prevented. In many endemic areas of dental fluorosis, it is found that dental caries is present among the persons who consume fluoride water and the presence of fluoride in dental fluorosis tooth is found. Hence, fluoride appears as double-edged weapon; on the one side, it produces dental fluorosis, and on the other side, it prevents dental caries. If it really prevents caries, then why caries occurs in teeth affected with dental

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fluorosis in endemic areas? Over the past decade, there has been some concern that the prevalence of fluorosis has been increasing in a number of countries, India being one of them. The present descriptive epidemiological study was conducted in Dharmapuri district to find out the prevalence of dental caries among the individuals who are exposed to fluoridated water.[3]

MATERIALS AND METHODS

A sample of 140 school students between the ages of 12 and –18 years was collected from various schools in endemic areas of the fluorosis of Dharmapuri district.

The children were assessed for dental fluorosis using Dean's fluoride index. Clinical examination was carried out using natural light and torch light to identify dental fluorosis in each tooth, two most severely affected teeth we are keen for grading of fluorosis using Dean's index of grading as questionable, very mild, mild, moderate, and severe. Dental caries is also assessed using decayed, missing, and filled teeth index and also recorded for all 140 children.

Information was collected through a study turned performance which included demographic variables such as name, age, sex, address along with scores for dental fluorosis, and dental caries indexes.

RESULTS

In the present study, the prevalence of dental caries among people with dental fluorosis has been recorded [Figure 1]. In Group I among 17 children with dental fluorosis, 9 (52.9%) have dental caries. Among 9 males with dental fluorosis, 5 (55.5%) have dental caries [Table 1]. Among 8 females with dental fluorosis 4 (50%) have dental caries [Table 2]. In Group II among 22 children with dental fluorosis 10 (45.4%) have dental caries. Among 15 males with dental fluorosis 5 (33.3%) have dental caries. Among 7 females with dental fluorosis 5 (71.4%) have dental caries [Table 3].

In Group III among 27 children with dental fluorosis 17 (62.9%) have dental caries. Among 12 males with dental fluorosis 6 (66.6%) have dental caries. Among 15 females with dental fluorosis 9 (60%) have dental caries. In Group IV among 38 children with dental fluorosis 29 (76.3%) have dental caries. Among 16 males with dental fluorosis 12 (75%) have dental caries. Among 22 females with dental fluorosis 17 (77.2%) have dental caries. In Group V among 36 children with dental fluorosis 30 (83.3) have dental caries. Among 18 males with dental fluorosis 14 (29.1%) have dental caries. Among 18 females with dental fluorosis 16 (88.8) have dental caries.

Table 1: Prevalence of dental caries in dental fluorosis in males

Dental fluorosis	No. of dental fluorosis (%)	No. of dental caries (%)	DMFT
Questionable	9 (12.8)	5 (55.5)	2
Very mild	15 (21.4)	5 (33.3)	1
Mild	12 (17.4)	8 (66.6)	2.5
Moderate	16 (22.8)	12 (75)	2.5
Severe	18 (25.7)	14 (29.1)	1.5
Total	70	44	

DMFT: Decayed, missing, and filled teeth

Table 2: Prevelence of dental caries in dental fluorosis in females

Dental fluorosis	No of dental fluorosis (%)	No of dental caries (%)	DMFT
Questionable	8 (11.4)	4 (50)	1
Very mild	7 (10)	5 (71.4)	1.5
Mild	15 (21.4)	9 (60)	1
Moderate	22 (31.4)	17 (77.2)	2
Severe	18 (25.7)	16 (88.8)	2.5
Total	70	51	

DMFT: Decayed, missing, and filled teeth

Table 3: Prevalence of dental caries in dental fluorosis in total

Dental fluorosis	No. of dental fluorosis (%)	No. of dental caries (%)	DMFT
Questionable	17 (10)	9 (52.9)	1.5
Very mild	22 (15.7)	10 (45.4)	2
Mild	27 (19.2)	17 (62.9)	1.5
Moderate	38 (27.1)	29 (76.3)	1.5
Severe	36 (25.7)	30 (83.3)	2.5
Total	140	95 (67.85)	

DMFT: Decayed, missing, and filled teeth

DISCUSSION

In summarizing the observation of dental fluorosis in the present study, it is found that people who consume more fluoride develop severe dental fluorosis. It is found that brown color was seen more prominent as bands in incisors, but such type of bands is not present in the posterior teeth. In dental fluorosis, since fluoride is incorporated it is expected that calcium content would be less and so deficient of structure, that is, fully calcified is less and these teeth are called hypoplastic teeth.[4] The prevalence of dental caries in children with dental fluorosis was studied. Students who have different grades of dental fluorosis were examined for the level of caries.

In Group I among 17 children with dental fluorosis, 9 (52.9%) have dental caries. Among 9 males with dental fluorosis, 5 (55.5%) have dental caries. Among 8 females with dental fluorosis, 4 (50%) have dental caries in Group II among 22 children with dental fluorosis, 10 (45.4%) have dental caries. Among 15 males with dental fluorosis, 5 (33.3%) have dental caries. Among 7 females with dental fluorosis, 5 (71.4%) have dental caries. In Group III among

Figure 1: Dental fluorosis present evidently in the upper central incisors

27 children with dental fluorosis, 17 (62.9%) have dental caries. Among 12 males with dental fluorosis, 6 (66.6%) have dental caries. Among 15 females with dental fluorosis, 9 (60%) have dental caries. In Group IV among 38 children with dental fluorosis, 29 (76.3%) have dental caries. Among 16 males with dental fluorosis, 12 (75%) have dental caries. Among 22 females with dental fluorosis, 17 (77.2%) have dental caries. In Group V among 36 children with dental fluorosis, 30 (83.3) have dental caries. Among 18 males with dental fluorosis, 14 (29.1%) have dental caries. Among 18 females with dental fluorosis, 16 (88.8) have dental caries. This result shows that in the present study dental caries prevalence is more in severe dental fluorosis.

Mann *et al.* have reported a statistically significant positive association between caries prevalence and fluorosis; the more severe the fluorosis level more is the caries rate. Our studies are in conformity with the various previous studies conducted.[5] Schiffner *et al.* in their study relating to the prevalence of caries and fluoride among Michigan children reported the prevalence of both caries and fluorosis which was significantly associated with community water supply. A total of 65% of children were caries free in areas of fluoride level of 1 ppm.[6] Pitts *et al.* reported caries incidence of 62% of permanent teeth and 68% of primary teeth in fluoride content in water varying from 0.512 to 3.15 ppm.[7] Pitts NB. in their study in Tanzania concluded that children in high fluoride area were at significantly higher risk of dental caries than in children with low fluoride areas.[8] Marthaler TM. in Sri Lanka reported that prevalence of caries ranged from 18 to 29% in different fluoride groups and proved that individuals with severe fluoride-related enamel defects are more susceptible to caries.[9] Dean *et al.,* in Rajasthan, have concluded that with an increase in the level of fluoride content in water from moderate to high the caries incidence also increases.[10]

Ganesh *et al.,* in Tamil Nadu, have concluded that with an increase in the level of fluoride content in water from moderate to high the caries incidence also increases.[11]

CONCLUSION

It is recorded that different grades of dental fluorosis exist. Moreover, these different grades may be due to the amount of fluoride ingested, the period exposure to fluoride, and dietary habits. Dental caries is recorded in dental fluorosis in the range of 45.4–83.3%. Dental caries prevalence is more as the severity of dental fluorosis increases. The excessive fluoride intake must occur during the period of tooth formation since the fluoride appears to affect the activity of ameloblasts. The affected ameloblasts produce a defective matrix, on to which during calcification calcium, phosphate and fluoride are deposited as calcium fluorapatite crystals. In dental fluorosis, fluoride is incorporated, and calcium is reduced. Dental fluorosis in hypocalcified condition is more prone to caries and destruction.

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